



THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

Applicants : Wolfgang MUELLER et al.
Serial No. : 09/169,060
Filed : October 9, 1998
For : DEVICE AND METHOD FOR CONTROLLING A
GENERATOR
Examiner : P. MEDLEY
Art Unit : 2834

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Assistant Commissioner
for Patents
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Reg. No. 36,197

Signature: 
Jong H. Lee

APPELLANTS' APPEAL BRIEF
UNDER 37 C.F.R. § 1.192

S I R :

On January 14, 2002, Applicants filed a Notice of Appeal from the final Office Action dated July 12, 2001, in which claims 1-6, 8-10, 13-18, 20-22 and 27-37 of the above-identified application were finally rejected. This Brief is submitted by Applicants in support of their appeal.

I. REAL PARTY IN INTEREST

The above-identified Applicants and Robert Bosch GmbH of Stuttgart, Germany, are the real parties in interest.

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II. RELATED APPEALS AND INTERFERENCES

No appeal or interference which will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal is known to the undersigned attorney or is believed by the undersigned attorney to be known to Applicants.

III. STATUS OF CLAIMS

Claims 1-6, 8-18, 20-24 and 27-37 are pending in this application. Applicants appealed from the final rejection of claims 1-6, 8-10, 13-18, 20-22 and 27-37 made in the Office Action mailed by the Patent Office on July 12, 2001. Of the claims presently on appeal, claims 1, 13, 27, 29, 35 and 36 are independent. Claims 2-6, 8-10, 31 and 32 ultimately depend from claim 1; claims 14-18, 20-22 and 33-34 ultimately depend from claim 13; claim 28 depends from claim 27; and claims 30 and 37 depend from claim 29. The claims on appeal are set forth in the Appendix submitted herewith. In the final Office Action dated July 12, 2001, the Examiner indicated that claims 11, 12, 23 and 24 are allowed.

IV. STATUS OF AMENDMENTS

No amendment has been made subsequent to the final Office Action dated July 12, 2001.

V. SUMMARY OF THE INVENTION

The present invention relates to a device and a method for controlling a generator, with which a rectifier bridge connected to the generator can be temporarily short-circuited, as a result of which power is temporarily stored in the stator inductors, which in turn results in higher phase voltages.

According to one embodiment of the present invention, as shown in Fig. 1, lower system costs and reduced space requirements are achieved by connecting an additional circuit arrangement to the rectifier bridge of the generator, via which the rectifier bridge can be short-circuited for brief periods of time, which results in the generator being boosted. (P. 2, l. 18-29). As long as the flow of power from the generator to the battery is interrupted, the power generated

is stored temporarily in the stator inductors of the generator, which results in an increase of the so-called phase voltage. (P. 2, l. 29-32).

As shown in Figure 1, generator G (e.g., a claw-pole generator) includes stator inductors L1, L2 and L3 and resistors R1, R2 and R3 which represent the winding resistors. (P. 4, l. 8-10). The generator produces phase voltages US1, US2, US3 which are formed from synchronous generated voltages U1, U2, U3 and the voltages at resistors R1, R2, R3 and stator inductors L1, L2, L3. (P. 4, l. 11-14). These voltages result in currents I1, I2, I3, which are rectified via diode bridge DB and in generator output current IG which serves to supply the vehicle electrical system loads. (P. 4, l. 14-16).

A circuit arrangement SCH including a transistor T, a diode D and a capacitor C is connected to generator G. (Fig. 1; p. 4, l. 27-28). The circuit arrangement SCH makes the generator control according to the present invention possible in that transistor T, which is an MOS field effect transistor connected parallel to diode bridge DB, for example, short-circuits diode bridge DB from time to time. (P. 4, l. 28-33).

Brief short-circuiting of diode bridge DB with power transistor T causes the flow of power from generator G to battery B to be interrupted, which makes boosting of the generator possible. (Fig. 1; p. 5, l. 7-10). In this connection, power is stored temporarily in stator inductors L1, L2 and L3 of generator G. (P. 5, l. 10-11). Diode D1 prevents current from flowing back and short-circuiting and discharging the downstream electrical system or battery B. (P. 5, l. 12-14). If transistor T blocks, the power stored in the stator inductors is released in the form of induced voltages which are combined with the respective synchronous generated voltages U1, U2 and U3, which results in a higher output voltage of the generator. (P. 5, l. 14-18). Capacitor C at the output of circuit arrangement SCH, which circuit arrangement may be designated as a generator step-up converter, serves to smooth out the pulsed output current. (Fig. 1; p. 5, l. 21-24).

Figures 2 and 3 show two additional exemplary embodiments according to the present invention, in which the rectifier bridge BD has been replaced by a fully controlled bridge with six circuit breakers, transistors T1 to T6,

for example. (P. 6, l. 12-19). Diode D1 serves as a freewheeling diode which must be considered a component of the fully controlled bridge and is connected to capacitor C. (P. 6, l. 19-21). In the exemplary embodiment shown in Figure 3, the freewheeling diode has been replaced by an additional transistor T7 which is also a component of the fully controlled bridge. (P. 6, l. 21-24).

In the embodiments shown in Figs. 2 and 3, a simultaneous activation of the six circuit breakers or transistors T1 to T6 of the fully controlled bridge circuit brings about a boost of generator G. (P. 6, l. 33-35). MOS field effect transistors, for example, can be used as circuit breakers. (P. 6, l. 35-36). During the phases in which circuit breakers T1 to T6 are conductive, power is temporarily stored in stator inductors L1, L2 and L3 and is released in the blocking phase of the transistors and results in an increase in phase voltages US1, US2 and US3, which causes generator G, which is driven by a shaft of an internal combustion engine, to make a higher voltage available for the production of an electrical system voltage level of 42 V, for example, particularly in the lower rotational speed range. (P. 6, l. 37 - p. 7, l. 8). Diode D1 of the exemplary embodiment shown in Figure 2 prevents battery B42 from also being short-circuited and discharged during the conducting phase of circuit breakers or transistors T1 to T7. (P. 7, l. 8-11).

In the exemplary embodiment shown in Figure 3, an additional circuit breaker, an MOS field effect transistor T7 is used instead of a diode. (P. 7, l. 13-15). This switch is controlled in such a way that it has its blocking phase during the conducting phase of the transistors of the bridge circuit and has its conducting phase during their blocking phase. (P. 7, l. 15-18). The output voltage can be regulated to 42 V by proper variation of the conducting and blocking time, for example by variation of the mark-to-space ratio, i.e., the ratio between conducting and non-conducting phases. (P. 7, l. 19-23). Capacitor C at the output of the integrated step-up converter T1 to T6 and D1, T1 to T6, T7 serves to smooth out the output voltage. (P. 7, l. 26-28).

Figure 4 shows another exemplary embodiment of the present invention, in which the bridge rectifier of the generator contains three diodes D2, D3, D4, as well as three transistors T8, T9, T10. (P. 8, l. 9-12). With this

embodiment of the rectifier bridge, by appropriately controlling the transistors, both rectification as well as voltage increase are possible. (P. 8, l. 12-14). The rectification arrangement thus represents a rectifier and a set-up converter. (P. 8, l. 14-16). By integrating the step-up converter (which functions as a DC voltage converter) into the bridge rectifier, the number of components may be reduced in comparison to the other exemplary embodiments of the present invention described above. (Fig. 4; p. 8, l. 20-23). The voltage drop at diode D1 of the step-up converter shown in Figure 2 is eliminated, making the power loss in the exemplary embodiment illustrated in Figure 4 smaller than in the exemplary embodiment illustrated in Figure 2, and thus the power efficiency is improved. (P. 8, l. 23-28). If transistors T8, T9, T10 are replaced by field-effect transistors, power efficiency is further improved, since the field-effect transistors have a smaller forward power losses in comparison to the diode losses. (P. 8, l. 28-32). As in the further exemplary embodiments according to the present invention, capacitor C smooths out the rectified outlet voltage of the generator. (P. 8, l. 34-36).

VI. ISSUE FOR REVIEW

The following issues are presented for review on appeal in this case:

- A) Whether the subject matter of claims 32 and 34-37 fails to satisfy the written description requirement under 35 U.S.C. § 112, first paragraph.
- B) Whether the subject matter of claim 29 is anticipated under 35 U.S.C. § 102(b) by U.S. Patent No. 4,825,139 to Hamelin et al. ("Hamelin").
- C) Whether the subject matter of claims 1-6, 8-10, 13-18, 20-22, 30, 31 and 33 is obvious under 35 U.S.C. § 103(a) over U.S. Patent No. 4,825,139 to Hamelin et al. ("Hamelin") in view of U.S. Patent 5,793,625 to Balogh ("Balogh reference").

VII. GROUPING OF CLAIMS

For purposes of this appeal, all claims do not stand or fall together: claims 1-6, 8-10, 13-18, 20-22, 30, 31 and 33 will be treated as one group; claim 29 will be treated as another group; and claims 32 and 34-37 will be treated as a

separate group. Appellants reserve the right to present additional reasons why the dependent claims are patentable over the prior art.

VIII. ARGUMENT

A. Rejection of Claims 32 and 34-37

Claims 32 and 34-37 stand rejected under 35 U.S.C. § 112, ¶1, as failing to provide adequate written description of the claimed subject matter. Regarding the "written description" requirement, Applicants note that "the fundamental factual inquiry [in resolving the written description issue] is whether a claim defines an invention that is clearly conveyed to those skilled in the art," and "[t]he subject matter of the claim need not be described literally in order for the disclosure to satisfy the description requirement." MPEP § 2163.02.

The Examiner states that the specification does not provide support for the following elements: a further semiconductor switching device; a free wheeling diode and a short-circuiting transistor used together; and transistors coupled in series. With respect to claims 32 and 34, which depend from claims 1 and 13, respectively, the Examiner appears to interpret the claimed phrase "wherein the transistor includes a further semiconductor switching device" as requiring two separate elements, i.e., "the transistor" and a separate "further semiconductor switching device." However, this is incorrect. A look at similar claims 2 and 31, both of which depend from claim 1, clearly indicates that "a further semiconductor switching device" merely indicates what type of element the transistor element may be. For example, claim 2 recites that "the transistor includes a MOS field-effect transistor," and claim 31 recites that "the transistor includes an insulated gate bipolar transistor." Accordingly, "a further semiconductor switching device" as recited in claims 32 and 34 merely indicates a general type of the transistor element that is distinguished from a MOSFET or an IGBT. Applicants note that the specification clearly indicates that the transistor element may be, for example, MOSFET, IGBT or a bipolar transistor, (see, e.g., p. 7, l. 35-36), thereby providing support for "a further semiconductor switching device" as recited in claims 32 and 34. Regarding a "freewheeling diode" and a

"short-circuiting transistor" being used together as recited in claims 35 and 36, the specification provides clear support at page 6, lines 12-24. In addition, regarding transistors coupled in series as recited in claim 37, the specification provides clear support at page 8, lines 9-18. Based on the foregoing, the rejection of claims 32 and 34-37 under 35 U.S.C. § 112, ¶1, as failing to provide adequate written description, should be reversed.

B. Rejection of Claim 29

The Examiner has finally rejected claim 29 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,825,139 to Hamelin et al. ("Hamelin reference"). It is respectfully submitted that this rejection based on the Hamelin reference should be reversed for the following reasons.

To anticipate a claim under § 102, a single prior art reference must identically disclose each and every claim element. See Lindeman Maschinenfabrik v. American Hoist and Derrick, 730 F.2d 1452, 1458 (Fed. Cir. 1984). If any claimed element is absent from a prior art reference, it cannot anticipate the claim. See Rowe v. Dror, 112 F.3d 473, 478 (Fed. Cir. 1997).

Although the Examiner contends that Hamelin reference discloses a step-up converter as recited in claim 29, Applicants respectfully maintain that the Hamelin reference merely discloses a "chopping" function, which cannot be equated with the claimed step-up converter. The Hamelin reference clearly states that it is desirable to deliver current at less than maximum strength and to use a separate chopper device as a means to reduce current strength. (Hamelin reference, Col. 2, ll. 20-24). The Hamelin reference consistently refers to the delivery of current in the "chopping" mode and does not implicitly or explicitly equate the chopper device to a step-up converter.

In support of the rejection, the Examiner relies on a passage from the Comprehensive Dictionary Of Electrical Engineering to demonstrate "why the chopping and clipping disclosed in column 8 of the [Hamelin] reference is for a step-up function." (Office Action dated 12/1/00, page 5). Applicants understand this statement to mean that the Examiner believes that the transistors expressly

described in Hamelin as a voltage chopping arrangement are also implicitly a step-up conversion arrangement as well. The dictionary cited by the Examiner defines a step-up converter in terms of a boost converter as follows:

a circuit configuration in which a transistor is switched by PWM trigger pulses and a diode provides an inductor-current continuation path when the transistor is off. During the transistor on-time, the current builds up in the inductor. During the transistor off-time, the voltage across the inductor reverses and adds to the input voltage, as a result, the output voltage is greater than the input voltage.

The text of Hamelin unequivocally describes transistors T1-T3 as chopping a particular voltage. While the Examiner has stated that "the chopping and clipping disclosed in column 8 of the reference is for a step-up function," Applicants submit that such conclusion is unsupported, especially since the dictionary definition never mentions voltage chopping, much less characterize voltage chopping and step-up conversion as different terms for the same operation. All that this definition does is describe, without ever mentioning voltage chopping either explicitly or implicitly, how an output voltage greater than an input voltage is produced. Since the dictionary definition of a step-up converter relied upon by the Examiner does not mention voltage chopping and does not characterize voltage chopping as equivalent to step-up conversion operation, the dictionary definition cannot establish that the chopping function in the Hamelin reference equates to a step-up converter. Based on the foregoing, the rejection of claim 29 should be reversed.

C. § 103(a) Rejection of Claims 1-6, 8-10, 13-18, 20-22, 30, 31 and 33

The Examiner has rejected claims 1-6, 8-10, 13-18, 20-22, 30, 31 and 33 under 35 U.S.C. § 103(a) as being unpatentable over the Hamelin

reference in view of U.S. Patent No. 5,793,625 to Balogh ("Balogh reference"). It is respectfully submitted that this rejection based on the combination of Hamelin and Balogh references should be reversed for at least the following reasons.

For a claim to be rejected for obviousness under 35 U.S.C. § 103, the prior art must teach or suggest each element of the claim, and it must also suggest combining the elements in the manner contemplated by the claim. See Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990), cert. denied, 111 S. Ct. 296 (1990); and In re Bond, 910 F.2d 831, 834 (Fed. Cir. 1990).

The Examiner concedes that Hamelin reference does not teach a smoothing capacitor as recited in independent claim 1, for example, but the Examiner relies on Balogh reference to overcome this deficiency. The Examiner contends that capacitor C in Balogh reference, which reference describes the capacitor as an "output capacitor" and a "decoupling capacitor," corresponds to the smoothing capacitor recited in the claims. Applicants note that the Examiner's characterization is unsupported. Column 8, lines 31-34 of the Balogh reference includes the following description: "The curve labeled 103 is the rectified output of the circuit, i.e., the voltage across the terminals of the decoupling capacitor C. It shows a significant amount of ripple." The output ripple is not eliminated in Balogh by operation of decoupling capacitor C, but only after the boost mode is enabled, at which time the FETs are opening and closing at a high speed. (Col. 8, l. 40-46). Accordingly, Balogh simply does not teach or suggest a smoothing capacitor as recited in independent claim 1. Based on the foregoing, even if one skilled the art were to combine the Hamelin and Balogh references, one would not be able to achieve the subject matter of claim 1.

Claims 2-6, 8-10 and 31 depend from claim 1, so the above argument in regard to claim 1 applies equally to claims 2-6, 8-10 and 31. Method claim 13 and its dependent claims 14-18, 20-22 and 33 similarly recite the feature of a smoothing capacitor function, so the above argument in regard

to claim 1 applies equally to claims 13-18, 20-22 and 33.

In regard to claim 30, claim 30 depends from amended claim 29. As stated above, the Hamelin reference does not anticipate amended claim 29, and the Balogh reference does not cure the deficiencies of the Hamelin reference as applied against claim 29. For at least this reason, claim 30 is allowable over the combination of Hamelin and Balogh references. Moreover, claim 30 includes the smoothing capacitor feature as recited in claim 1, so claim 30 is also allowable based upon the arguments set forth above in connection with claim 1.

IX. CONCLUSION

For the foregoing reasons, it is respectfully submitted that the final rejection of claims 1-6, 8-10, 13-18, 20-22, and 27-37 should be reversed.

Respectfully submitted,

KENYON & KENYON

Dated: 4/4, 2002

By: for Richard L. Mayer
Richard L. Mayer
Reg. No. 22,490

CUSTOMER NO. 26646
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Jong H. Lee

**APPENDIX TO APPELLANTS' APPEAL BRIEF
UNDER 37 C.F.R. § 1.192**

SIR:

The claims involved in this appeal, claims 1-6, 8-10, 13-18, 20-22 and 27-37, in their current form after entry of all amendments presented during the course of prosecution, are set forth below:

APPEALED CLAIMS:

1. A device for controlling a generator including a diode bridge,
comprising:

a transistor for at least temporarily short-circuiting the diode bridge,

the transistor including an interrupter connected parallel to the diode bridge; and

a capacitor smoothing a current detected at a voltage detection point, wherein the transistor has a base which receives a control signal.

2. The device according to claim 1, wherein the transistor includes a MOS field-effect transistor.

3. The device according to claim 1, wherein the control signal is a modulatable signal, the modulatable signal having a frequency which is adjustable for setting a voltage at an output of the diode bridge that is substantially higher than a predetermined generator output voltage.

4. The device according to claim 3, wherein the modulatable signal includes one of a pulse-width modulated signal and a further signal having a variable mark-to-space ratio.

5. The device according to claim 4, wherein the mark-to-space ratio of the modulatable signal is determined by generating phase voltages from the generator corresponding to higher predetermined voltages at the output of the diode bridge.

6. The device according to claim 1, further comprising:

a diode element coupled between the diode bridge and the voltage detection point, the diode element allowing a flow of the current only from the generator to the voltage detection point.

8. The device according to claim 1, wherein the diode bridge includes a resonant controller providing a step-up converter function using predetermined switching principles.

9. The device according to claim 1, wherein the generator is a three-phase generator including three stator inductors.

10. The device according to claim 9, wherein the generator rectifies a current induced in the stator inductors by synchronously generated voltages.

13. A method for controlling a generator having a diode bridge, comprising the steps of:

at least temporarily short-circuiting the diode bridge using a transistor, the transistor including an interrupter coupled parallel to the diode bridge;

providing a control signal to a base of the transistor for controlling the generator; and

smoothing a current detected at a voltage detection point using a capacitor.

14. The method according to claim 13, wherein the transistor includes a MOS field-effect transistor.

15. The method according to claim 13, wherein the control signal is a modulatable signal, the modulatable signal having a frequency which is adjustable for setting a voltage at an output of the diode bridge that is substantially higher than a predetermined generator output voltage.

16. The method according to claim 15, wherein the modulatable signal includes one of a pulse-width modulated signal and a further signal having a variable mark-to-space ratio.

17. The method according to claim 16, further comprising the step of:

determining the variable mark-to-space ratio to generate phase voltages from the generator corresponding to higher predetermined voltages at the output of the diode bridge.

18. The method according to claim 13, further comprising the step of:

coupling a diode element between the diode bridge and the voltage detection point, the diode element providing a flow of the current

only from the generator to the voltage detection point.

20. The method according to claim 13, further comprising the step of:
implementing a step-up converter function using predetermined
switching principles and a resonance converter.

21. The method according to claim 13, wherein the generator is a three-
phase generator including three stator inductors.

22. The method according to claim 21, wherein the generator rectifies a
current induced in the stator inductors by synchronously generated
voltages.

27. A device for controlling a generator, comprising:
a controlled transistor bridge including:

a plurality of first transistors, each one of the plurality of first
transistors being coupled to at least another one of the plurality of first
transistors, and

one of a second transistor coupled to at least one of the plurality
of first transistors and a freewheeling diode coupled to at least one of the
plurality of first transistors, wherein the controlled transistor bridge
provides a step-up converter function.

28. The device according to claim 27, further comprising:
a capacitor smoothing a current detected at a voltage detection point.
29. A device for controlling a generator, comprising:
a rectification arrangement including:
a rectifier including a plurality of diodes, and
a step-up converter including a plurality of transistors, each one
of the plurality of transistors being coupled to a corresponding
one of the plurality of diodes, wherein the plurality of
transistors is controlled to enable the rectification arrangement
to perform a step-up converter function.
30. The device according to claim 29, further comprising:
a capacitor smoothing a current detected at a voltage detection point.
31. The device according to claim 1, wherein the transistor includes an
insulated gate bipolar transistor.
32. The device according to claim 1, wherein the transistor includes a
further semiconductor switching device.
33. The method according to claim 13, wherein the transistor includes an
insulated gate bipolar transistor.

34. The method according to claim 13, wherein the transistor includes a further semiconductor switching device.

35. A device for controlling a generator including a controlled transistor bridge having a freewheeling diode, comprising:

a transistor for at least temporarily short-circuiting the controlled transistor bridge, the transistor including an interrupter connected to the controlled transistor bridge,

wherein the transistor has a base which receives a control signal, and wherein the controlled transistor bridge provides a step-up converter function.

36. A method for controlling a generator having a controlled transistor bridge including a freewheeling diode, the method comprising the steps of:

at least temporarily short-circuiting the controlled transistor bridge using a transistor, the transistor including an interrupter coupled to the controlled transistor bridge;

providing a control signal to a base of the transistor for controlling the generator; and

providing a step-up converter function using the controlled transistor bridge.

37. The device according to claim 29, wherein each one of the plurality of

transistors is coupled in series to the corresponding one of the plurality of diodes.

Respectfully submitted,

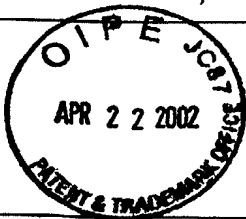
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Examiner
P. Medley

Art Unit
2834

Invention Title
**DEVICE AND METHOD FOR CONTROLLING
A GENERATOR**

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Date: 4/11, 2002

Reg. No. 36,197

Signature:

Jong H. Lee

Further to the Notice of Appeal dated January 14, 2002, and filed on
February 11, 2002, in the above-referenced application, enclosed are three
copies of an Appeal Brief. Accompanying the Appeal Brief is the Appendix to
the Appeal Brief.

The Commissioner is hereby authorized to charge payment of the 37
C.F.R. § 1.17(c) appeal brief filing fee of \$320.00 and any additional fees
associated with this communication to the deposit account of **Kenyon &
Kenyon**, deposit account number **11-0600**.

Dated: 4/11, 2002

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